

TAXONOMY OF THE LARVAE OF SOME NORTH
AMERICAN NOVIINI
(Coleoptera, Coccinellidae)

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Of the numerous species of Coccinellidae named and described, *Rodolia cardinalis* (Mulsant) has received a major portion of publicity. The quantity of literature regarding this species is great, but too little deals with the morphology and taxonomy of its larva in relation to the larvae of closely related species. Although a comprehensive study of the approximately 55 known species of the tribe Noviini is desirable, owing to the lack of study material this paper deals only with the larvae of the species occurring in America north of Mexico.

As proposed by previous authors and now accepted, *Exoplectra subaenescens* Gorham is placed in the Exoplectrini, and *Novius koebelei* Coquillett is transferred to the genus *Rodolia*. Such being the case, the tribe Noviini is represented in North America principally by two genera: *Rodolia*, through the introduction of *R. cardinalis* and *R. koebelei* into California from Australia, and *Anovia*, native to the southwestern states and represented by its single species, *A. virginalis* (Wickham). Another monobasic genus of the tribe is represented in Mexico by *Vedalia seiboldi* Mulsant.

The larvae of *Rodolia cardinalis* and *R. koebelei* were described by Coquillett in 1889 and 1893, respectively. Following this author, others have redescribed the larva of *R. cardinalis*, but the descriptions are inadequate for practical taxonomic purposes. It seems desirable, then, to redescribe and compare the larvae of the species in question and to formulate a key by means of which they may be distinguished. The descriptions herein given are based upon larvae taken with associated adults or upon reared material. The identifications of the adults were made or verified by E. A. Chapin, United States National Museum, Washington, D. C.

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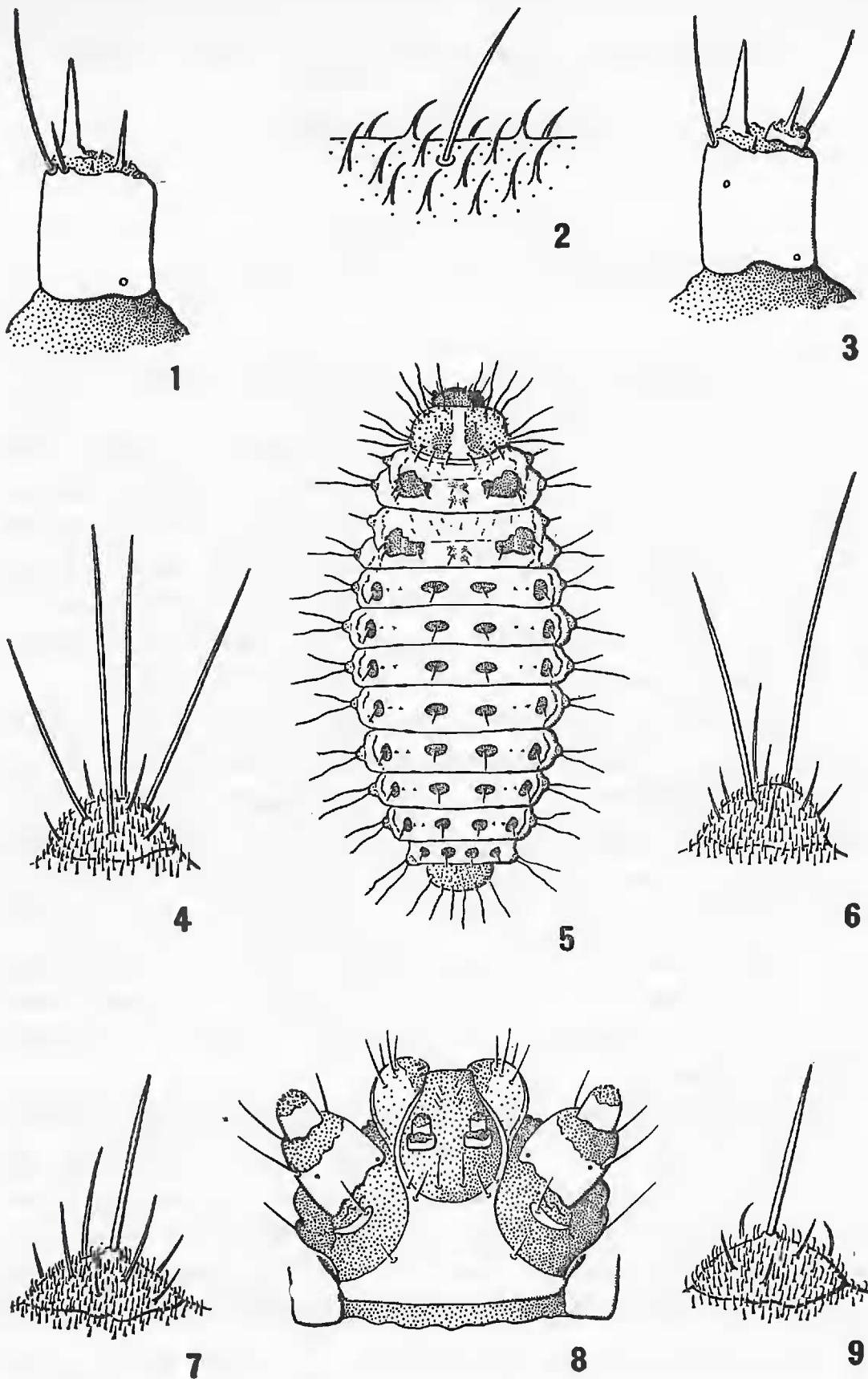


Fig. 1, antenna, *Anovia virginalis* (Wickh.); 2, asperities of body wall; 3, antenna, *Rodolia cardinalis* (Muls.); 4, lateral struma, *R. koebelei* (Coq.); 5, larva, *R. cardinalis*; 6, lateral struma, *R. cardinalis*; 7, dorsal struma, *R. koebelei*; 8, ventral mouthparts, *R. cardinalis*; 9, dorsal struma, *R. cardinalis*.

Since the larvae of the Coccinellidae exhibit a great variation in structure, some of them may be confused with the few chrysomelid larvae they closely resemble. They may be distinguished, however, from the chrysomelid and other larvae by the possession of various characters. In the larvae of the Coccinellidae the head always possesses three ocelli on each side and usually a depression located anteriorly on each frontal suture. The mandible is broad at its base, narrowed distally, usually with simple or bidentate apex, and generally possessing a distinct retinaculum. If the mandible is multidentate and bears a retinaculum, the teeth are small; if the mandible is multidentate and without a retinaculum, the teeth are large and digitiform. The stipes is fused with its corresponding cardo, and the hypopharyngeal bridge is present.

TRIBE NOVIINI GANGLBAUER

The tribe Noviini, as here interpreted, is based on the study of the three North American species and *Rodolia bellus* Blackburn from Australia. Its members may be distinguished from other coccinellid larvae by the fusion of the cardines, submentum and mental area into a solid, sclerotized and pigmented structure possessing a slender anterior extension on each side. The extensions pass anteriorly and laterally about the labial palpi and then converge in the buccal area. The entire structure assumes the appearance of an egg cup in which are encompassed the labial palpi. (See fig. 8.).

The close similarity of the larvae of the four species permits a further characterization of the tribe and general description applicable to all.

Body (fig. 5) ovoid, with greatest width at second and third abdominal segments; strongly convex dorsally, slightly convex ventrally; abdomen in general view with longitudinal series of strumae¹; pleura protuberant. Pronotum trapezoidal, lateral and anterior margins rounded, sparsely setiferous and with chalazae,¹ setae of chalazae long, pale yellow; tergite longitudinally divided by broad, semi-membranous, non-pigmented line, with dark area immediately on each side of midline, densely asperate and with each posterolateral angle elevated into struma. Mesonotum and metanotum each

¹*Chalaza*, a distinct, frequently slight, pimplelike projection of the body wall bearing a seta. *Struma*, a distinct, moundlike projection of the body wall upon which are situated a few chalazae.

incompletely divided transversely by shallow depression; tergites distinct, small, situated dorsolaterally, asperate and with setae and chalazae; mesopleura and metapleura each with small anterior and large posterior struma. Abdominal segments 1-8 each with intersegmental pore, a dorsal, dorsolateral, and lateral struma on each side; pleura protuberant; ninth abdominal segment semicircular, broader than long, setiferous and with chalazae. Body membrane and sclerites, including strumae, with seta-like asperities. Legs well developed, slender, sclerotized and darkly pigmented; coxae of corresponding legs widely separated; tibia slightly longer than femur, with distinct, setiferous, semimembranous and non-pigmented, ventral surface or "sole"; terminal setae of tibia abruptly enlarged distally; claw gradually and evenly curved, base simple, broad.

Head small, pigmented, transversely subrectangular; epicranial suture lacking; frontal sutures indicated posteriorly by broad, non-pigmented, straight lines, indistinct and obsolete anteriorly; sutural fossae of head distinct, linear; head adorned with few long setae, principally about ocelli. Labrum, when viewed from above, subrectangular, broader than long, posterior and lateral marginal areas darkly pigmented, mesal and anterior areas non-pigmented and semi-membranous. Antenna composed of one or two segments, if two-segmented, second segment small. Mandible apically simple, base enlarged, retinaculum present. Maxillary palpus two-segmented and with distinct, sclerotized and pigmented, narrow palpifer; first segment prominent, large, broader than long; second segment small, about one-half length and diameter of first. Mala bluntly subconical, proximally sclerotized and pigmented, distally non-pigmented and membranous. Labial palpus two-segmented, second segment longer but of less diameter than first. Premental sclerite lacking.

KEY TO GENERA AND SPECIES

1. Antenna composed of two segments; second segment small, short and broad (fig. 3).....*Rodolia*....2
- Antenna composed of a single segment (fig. 1).....
.....*Anovia virginalis* (Wickham)
2. Lateral strumae of abdominal segments 1-8 each with two chalazae of which the setae are conspicuous and long (fig. 6); head capsule without asperities.....*R. cardinalis* (Mulsant)
- Lateral strumae of abdominal segments 1-8 each with four chalazae of which the setae are conspicuous and long (fig. 4); head capsule with few short, spine-like asperities immediately lateral to each frontal suture.....*R. koebeli* (Coquillett)

GENUS RODOLIA Mulsant

The genus *Rodolia* is represented in this study by *R. cardinalis* and *R. koebeli*, but a third species, *R. bellus*, although

not included in this treatment of the genus, has been studied. If the larvae of these species are typical of the genus, the following characters may be considered applicable:

Antenna composed of two segments; first segment large, with stout, colorless, acute, sensory process on ventral terminal area and small second segment on dorsal terminal area; second segment about one-third or less size of first, terminally with slender, acute sensory process and several minute, acute, sensory papillae. Body with fine, seta-like asperities, asperities of membrane finer than of sclerites, those of membrane fine to extremely fine, sometimes lacking in dorsal areas. Strumae asperate and setiferous.

RODOLIA CARDINALIS (MULSANT)

Body sparsely setiferous, setae short; membrane and sclerites, including strumae, densely covered with fine, seta-like asperities and few fine, pale yellow setae (fig. 2). Pronotum with chalazae and fine setae; each posterolateral angle with three chalazae of which the setae are about three-fourths as long or as long as pronotum; mesothoracic and metathoracic tergites sparsely setiferous, each with single mesal and two lateral chalazae the setae of which are stout, stiff, and brown. Anterior struma of each mesopleurum and metapleurum with fine, pale, short setae and single chalaza with long, brownish-yellow seta; each posterior struma setiferous and with two chalazae, one anterodorsal to other, setae of chalazae about as long or longer than segment. Dorsal and dorsolateral strumae of abdominal segments 1-8 darkly pigmented, each with fine, brownish-yellow setae and single prominent chalaza with stout, stiff, brown seta, seta about one-third length of segment (fig. 9); each lateral struma of abdominal segments 1-8 bearing two chalazae (fig. 6), one anterodorsal to other, setae of chalazae one and one-half to two times length of segment, seta of anterodorsal chalaza one-half to three-fourths length of other, longer on posterior segments. Head uniformly pigmented, smooth, sparsely setiferous.

Material studied: Numerous specimens from California, Louisiana, and Mexico.

RODOLIA KOEBELEI (COQUILLET)

Body with few, fine, pale yellow setae; membrane and sclerites, including strumae, very densely covered with fine, seta-like asperities, asperities of sclerites slightly coarser than of membrane. Pronotum with chalazae and fine setae; each posterolateral angle with three chalazae of which the setae are about as long as pronotum; mesothoracic and metathoracic tergites sparsely setiferous, each with single mesal and two lateral chalazae of which the setae are slender, slightly curved, brownish-yellow, prominent. Anterior

struma of each mesopleurum and metapleurum with fine, pale setae and single chalaza with long, pale yellow seta; posterior strumae each similarly setiferous and with four chalazae, one situated anteriorly, one posteriorly, one dorsally, and one ventrally, setae of chalazae about one and one-half times as long as segment, anterior seta shortest of four. Dorsal and dorsolateral strumae of abdominal segments 1-8 darkly pigmented, each with fine, pale setae and chalazae of various sizes of which the seta of one is long, brownish-yellow and about one-third as long as segment (fig. 7); each lateral struma of abdominal segments 1-8 bearing four chalazae (fig. 4), two horizontally and two vertically situated, setae of chalazae about one and one-half times length of segment, seta of anterior chalaza shortest of four, progressively longer to subequal on posterior segments. Head uniformly pigmented, setiferous, with small spine-like asperities lateral to each frontal suture.

Material studied: One specimen from California; three from Brisbane, Australia.

GENUS ANOVIA CASEY

The genus *Anovia* is represented by its single species, *A. virginalis* (Wickham). It is listed as occurring in Utah and Texas, but it has been taken in other southwestern states.

A. virginalis larvae can be distinguished from members of *Rodolia* principally by the number of antennal segments. In this species the antenna (fig. 1) is composed of a single segment as compared with the two-segmented antenna found in the species of *Rodolia*. Terminally, it possesses a stout, acute, colorless, sensory process, a similar but shorter sensory process, and several minute, acute, sensory papillae. The short, slender process appears to be homologous with that possessed by the small, second antennal segment of the *Rodolia*.

ANOVIA VIRGINALIS (WICKHAM)

Body sparsely setiferous, setae pale yellow; membrane and sclerites, including strumae, uniformly covered with fairly coarse, seta-like asperities, asperities separated by a distance approximately one-half to three-fourths length of one of the asperities. Pronotum with chalazae and setae, each posterolateral angle with two chalazae, setae of chalazae longer than surrounding setae. Mesothoracic and metathoracic tergites sparsely setiferous, setae of various sizes, each tergite with one mesal and two lateral chalazae each with long, brownish-yellow seta. Anterior struma of each mesopleurum and metapleurum with setae of various sizes and single chalaza with long seta; posterior struma similarly setiferous,

with two chalazae, one anterodorsal to other, setae of chalazae long and prominent. Dorsal and dorsolateral strumae of abdominal segments 1-8 pigmented, each with fine, pale setae and chalazae of various sizes, seta of one prominent, brownish-yellow, about one-third as long as segment (see fig. 7); each lateral struma of abdominal segments 1-8 with chalazae of various sizes of which the setae of two are conspicuous, each about as long as segment or slightly longer. Head setiferous, uniformly pigmented, with few, small, spine-like asperities lateral to each frontal suture.

Material studied: Five specimens from New Mexico.

REFERENCES

- COQUILLET, D. W., 1889. The imported Australian Ladybird, *Vedalia cardinalis*. *Insect Life* 2:70-74, 2 figs.
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A NEW SUBSPECIES OF BUTTERFLY

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While collecting in the vicinity of Folsom in northeast New Mexico, we took a series of a new subspecies of *Strymon ontario* which we describe in this paper. Collecting in this area was of particular interest because nearly all of the species of butterflies that we collected showed basic subspecific differences*, most of which (in our opinion) have not developed sufficiently to merit names at this time.

Strymon ontario violae Stallings and Turner, new subspecies

Resembles *Strymon ontario autolytus* on the upper surfaces except that the ground color is a dark gray-brown rather than a red-brown. On the upper surfaces of the fore wings the males have four fulvous (orange) spots, while the females have two such spots. The hind wings in both sexes have two (sometimes three) restricted fulvous spots in the anal area. The fulvous spots in both sexes are of a more yellowish color than the fulvous in *autolytus* and the fulvous in *viola* has a tendency to be faded on the inner side of the spot.

*It being our opinion that one of the basic characters of valid subspecies of Lepidoptera on continental areas is change of ground color.